ADC-9532

Analog Audio to AES/EBU Converter

User Manual

ROSS

Video Production Technology

ADC-9532 User Manual

- Ross Part Number: **9532DR-004-02**
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Important Regulatory and Safety Notices to Service Personnel

Before using this product and any associated equipment, refer to the "**Important Safety Instructions**" listed below to avoid personnel injury and to prevent product damage.

Product may require specific equipment, and/or installation procedures to be carried out to satisfy certain regulatory compliance requirements. Notices have been included in this publication to call attention to these specific requirements.

Symbol Meanings

Protective Earth — *This symbol identifies a Protective Earth (PE) terminal, which is provided for connection of the supply system's protective earth (green or green/yellow) conductor.*

This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.

Warning — *The symbol with the word "**Warning**" within the equipment manual indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.*

Caution — *The symbol with the word "**Caution**" within the equipment manual indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.*

Warning Hazardous Voltages — *This symbol is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product enclosure that may be of sufficient magnitude to constitute a risk of shock to persons.*

ESD Susceptibility — *This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.*

Important Safety Instructions

1. **Warning** – Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. The safe operation of this product requires that a protective earth connection be provided. A grounding conductor in the equipment's supply cord provides this protective earth. To reduce the risk of electrical shock to the operator and service personnel, this ground conductor must be connected to an earthed ground.
6. Do not defeat the safety purpose of the grounding-type plug. A grounding type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit in to your outlet, consult an electrician for replacement of the obsolete outlet. Protect the power cord from being walked on or pinching particularly at plugs, convenience receptacles, and point where they exit from the apparatus.

7. **Warning – Indoor Use: WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
8. Do not block ventilation openings. Install in accordance with manufacturer's instructions.
9. Do not install near heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
10. Do not use this apparatus near water.
11. Only use attachments/accessories specified by the manufacturer.
12. Unplug this apparatus during lightning storms or when unused for long periods of time.
13. Clean only with a dry cloth.
14. To avoid electrical shock, disconnect the A/C power cord before any servicing.
15. Refer all servicing to qualified personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug damage, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

EMC Notices

United States of America
FCC Part 15

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Notice — *Changes or modifications to this equipment not expressly approved by Ross Video Limited could void the user's authority to operate this equipment.*

CANADA

This Class "A" digital apparatus complies with Canadian ICES-003.

Cet appariel numerique de la classe "A" est conforme a la norme NMB-003 du Canada.

EUROPE

This equipment is in compliance with the essential requirements and other relevant provisions of **CE Directive 93/68/EEC**.

INTERNATIONAL

This equipment has been tested to **CISPR 22:1997** along with amendments **A1:2000** and **A2:2002**, and found to comply with the limits for a Class A Digital device.

Notice — *This is a Class A product. In domestic environments, this product may cause radio interference, in which case the user may have to take adequate measures.*

Maintenance/User Serviceable Parts

Routine maintenance to this GearLite product is not required. This product contains no user serviceable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed under the

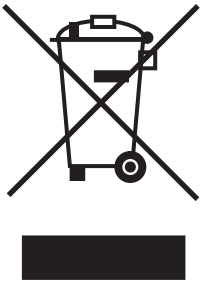
"Contact Us" section on the last page of this manual. All GearLite products are covered by a generous 3-year warranty and will be repaired without charge for materials or labor within this period. See the "Warranty and Repair Policy" section in this manual for details.

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Ross Video for more information on the environmental performances of our products.

Introduction

Overview

The ADC-9532 is a broadcast quality Analog Audio to AES/EBU Converter used to convert two (2) analog audio channels to an AES/EBU signal. The ADC-9532 accepts one stereo (A, B) analog audio pair and provides three (3) copies of the AES/EBU signal. The conversion from analog to digital is performed with 20bit or 24bit precision. The ADC-9532 supports sampling rates of 32kHz and 48kHz (with a video or AES reference or free running) and 44.1kHz (with a valid AES reference signal only). The ADC-9532 has been designed for use in 75ohm coaxial (SMPTE 276M or AES-3id) systems but can be easily used in balanced (twisted pair) systems with the use of a 75ohm to 110ohm converter, such as the GearLite AES-9523 or AES-9525 AES converters.

The two analog audio signals are input through the 12-pin audio terminal block. The ADC-9532 uses a very high quality anti-aliasing filter on its inputs to ensure that the converted signal has very low noise and distortion artifacts. The A to D conversion process is performed by a state of the art 256X over-sampling Delta Sigma Modulator ADC. Three (3) copies of the unbalanced AES/EBU signal are provided on the BNC connectors on the rear of the unit.

The ADC-9532 has the ability to phase and frequency lock to an external AES DARS reference (per AES11-1997) or to frequency lock to an external analog PAL or NTSC video reference. An LED on the front panel indicates the presence of an external reference signal. If there is a loss of the reference signal, the unit will switch to an internal reference. The unit will automatically switch back to the selected reference when the external reference returns.

The ADC-9532 has an extremely stable internal clock and can be operated without an external reference signal.

A coarse input attenuator switch (20dB or 24dB) and fine input attenuator potentiometers (+/-3dB, one for each channel) are provided to precisely match your facility's house reference audio levels. The ADC-9532 can accommodate any maximum input level in the +17dBu to +27dBu range.

The ADC-9532 is designed and manufactured to meet the highest quality broadcast industry standards. It is an ideal and cost effective solution for converting analog audio into an AES/EBU signal.

Simplified Block Diagram

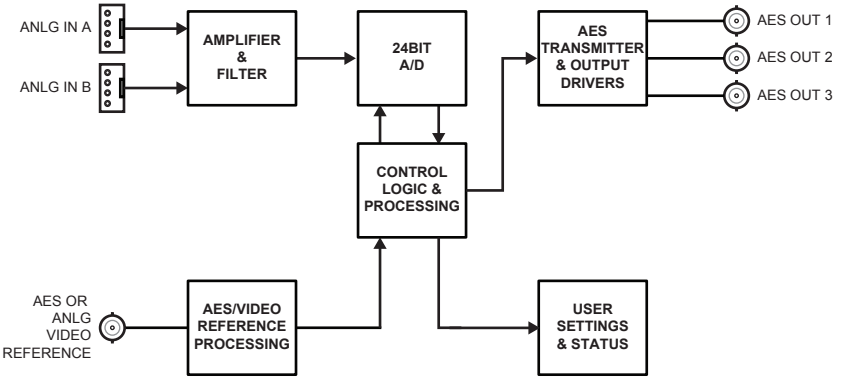


Figure 1 *Simplified Block Diagram of ADC-9532 Functions*

Features

The ADC-9532 includes the following features:

- Support for 32kHz, 44.1kHz, and 48kHz sampling rates
- User selectable 20bit or 24bit ADC resolution
- Built in 75ohm reference termination
- External reference locking to either AES audio (DARS) or analog video (PAL or NTSC)
- Front panel indication of reference signal presence
- Adjustable input level range from +17dBu to +27dBu
- 3-year warranty

Installation

Static Discharge

Whenever handling the ADC-9532 and other related equipment, please observe all static discharge precautions as described in the following note:

ESD Susceptibility — *Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments, such as carpeted areas, and when wearing synthetic fiber clothing. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

Unpacking

Unpack each ADC-9532 you received from the shipping container and check the contents to ensure that all items are included. If any items are missing or damaged, contact your sales representative or Ross Video directly.

Mounting and Installation

The ADC-9532 can be mounted in any convenient location. However, to ensure long life for this product, observe the following precautions and operating requirements:

- Maintain an ambient temperature of 20°C to 40°C.
- Allow for air circulation around the chassis for convectional cooling.

Many different mounting positions are possible with the included mounting hardware. Some installation options are permanent and require careful consideration of the final positioning before installation. Please note that in some mounting locations, the power adaptor must be affixed in a similar manner as the chassis.

Other possible options include the use of adhesive magnetic sheets (not included) affixed to the chassis and the power adaptor, for removable mounting on metal cabinets etc.

Cable ties may be necessary in some applications to relieve strain on the mounting hardware and the connectors.

Surface Mount Strips

The included VELCRO® brand surface mount strips allow the GearLite module and power supply to be affixed to a permanent location during use and easily

removed for adjustments. Carefully consider the installation location before proceeding; the adhesive is very aggressive and is not easily removed. The adhesive will cure fully in 24 hours.

To install the Surface Mount Strips

1. Remove the **Protective Backing Film** from the adhesive on the bottom of the two VELCRO® brand **Surface Mount Strips**.
2. Adhere the **Surface Mount Strips** to the bottom side of the chassis. (**Figure 2**)

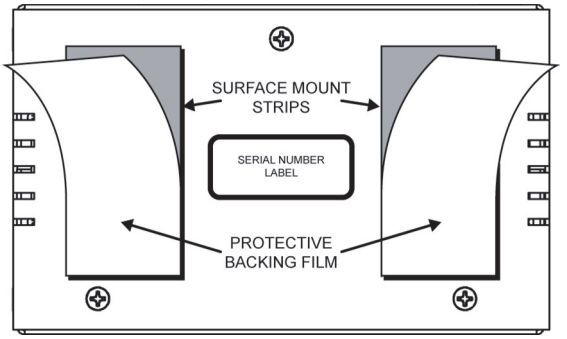


Figure 2 *Surface Mount Installation Option*

3. Remove the **Protective Backing Film** from the other side of the VELCRO® brand **Surface Mount Strips**.
4. Press the chassis into position on the surface you want to mount it to.

Operating Tip — *An additional VELCRO® brand **Surface Mount Strip** is available to mount the power adapter.*

Non-Slip Pads

Four non-slip adhesive pads have been supplied for desktop placements. Simply remove the protective backing film from the adhesive and affix one non-slip pad to each of the four corners on the bottom of the chassis.

Optional Mounting Accessories

Ross Video is committed to providing practical solutions for the needs of your high-quality broadcast facility.

Flat Metal Plate

Use the flat metal plate for permanent mounting to a rack, a desk, or any other location where bolts or screws can be applied. Be sure to position the module to allow for operator adjustments, if required.

To install the Flat Metal Plate

1. Remove the **2** screws from the bottom of the chassis.
2. Install the **Flat Metal Plate** onto the bottom of the chassis (**Figure 3**) using the screws provided in the Mounting Kit. Do not use the screws removed during **Step 1.**

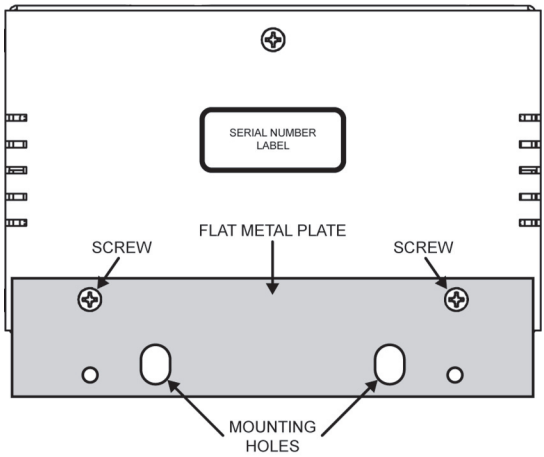


***Figure 3** Flat Metal Plate Installation Option*

3. Install the chassis in the desired location using the **Mounting Holes** on the **Flat Metal Plate**. Mounting screws are not provided by Ross Video.

Angle Mounting Bracket

The Angle Mounting Bracket (**Figure 4**) allows a single GearLite module to be installed in positions not possible with the flat metal plate. The bracket has a 90° angle. Mounting screws are not provided by Ross Video.

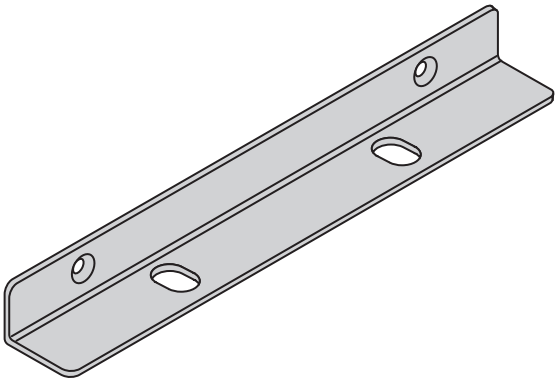


Figure 4 *Angle Mounting Bracket*

Setup

Power Adapter and Supply

Connect the PS-9000 power adaptor to the power supply connector. The PS-9000 provides up to 2A of regulated +5V DC (5%). The DC power cord has a locking connector that securely fastens into the power supply DC jack on the ADC-9532. The ADC-9532 has a standard miniature power jack (center pin positive).

If using an adaptor other than the PS-9000, ensure that:

- the polarity is correct
- the voltage is +5V DC regulated to 5%
- sufficient current for the ADC-9532 is supplied

Caution — *Use of improper adaptors may damage the ADC-9532 and will void the warranty.*

Installations outside of North America using line voltages of 200-240V require a plug, certified for the country of use, to be installed on the supplied line cord. Refer to the section "**Important Regulatory and Safety Notices to Service Personnel**" at the front of this manual for details.

Cable Connections Overview

Connect the cables to the ADC-9532 according to the designations indicated on the chassis label and **Figure 5**.

The ADC-9532 has the following cable connections:

- 1 AES or analog video reference BNC input
- 3 AES BNC outputs
- 2 balanced analog audio inputs (positive, negative, and ground terminals for each channel) on a 12-pin terminal block
- 1 power supply input

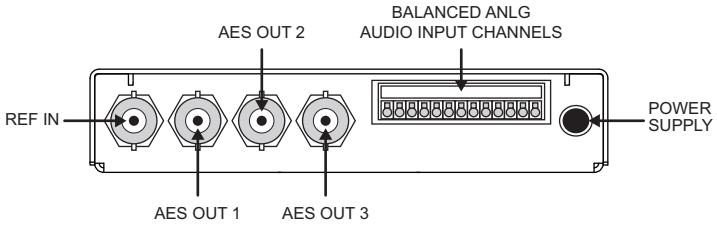


Figure 5 *ADC-9532 Connections*

AES Connections

Connect the digital outputs as required from the three AES BNC connectors. It is not necessary to terminate unused outputs.

Analog Connections

On the rear edge of the ADC-9532 there is a removable 12-pin audio terminal block which has slots for the positive, negative, and grounded wires of two balanced analog audio cables.

To wire the cables to the connector

1. Gently pull the block from the unit.
2. Following the diagram on the top of the unit, insert an analog audio wire into the designated polarity slot on the block.
3. Use a tweaker screwdriver to tighten the slot's connector clamp on the block.
4. Repeat steps 2 and 3 for each wire on each input.
5. Once the cables have been wired to the block, insert the block back onto the unit so that the slotted tongues fit in the grooved side on the block socket.

Reference Connection

Connect an analog video (NTSC or PAL) or an AES/EBU reference signal to the ADC-9532 according to the designation indicated on the chassis label. The input is internally terminated at 75ohm. Note that the ADC-9532 may be operated without a reference input.

DIP Switch Setup

Using the DIP switches shown in **Figure 6** and **Table 1**, configure the various parameters of the ADC-9532 for your requirements. **Figure 6** shows all switches in the DOWN position.

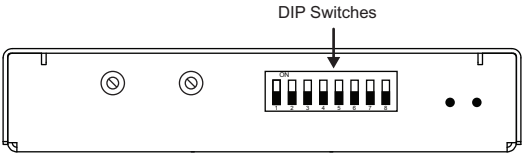


Figure 6 *ADC-9532 Front Edge User Controls*

Table 1 DIP Switch Positions

Switch Number	Down Position	Up Position
1	Ch. A Headroom Adjust +24dBu	Ch. A Headroom Adjust +20dBu
2	Ch. B Headroom Adjust +24dBu	Ch. B Headroom Adjust +20dBu
3	AES Reference	Video Reference
4	Emphasis Off	Emphasis On
5	24Bit	20Bit
6	Other Rate	32kHz
7	Other Rate	44.1kHz
8	Other Rate	48kHz

SW1 - Channel A Headroom

Use this switch to choose between 24dB or 20dB levels for AES Channel A. The A Gain potentiometer adds ± 3dB continuous adjustment for Channel A. Refer to the section "**Potentiometer Setup**" on page 16 for details on using the potentiometers.

SW2 - Channel B Headroom

Use this switch to choose between 24dB or 20dB levels for AES Channel B. The B Gain potentiometer adds ± 3dB continuous adjustment for Channel B. Refer to the section "**Potentiometer Setup**" on page 16 for details on using the potentiometers.

SW3 - Reference

Use this switch to select either AES or video reference, depending which reference signal you have connected to the reference input BNC.

Note — *If you are using a video reference, do not set **SW7** to **UP**. Use **SW6** or **SW8** instead.*

SW4 - Emphasis

Set this switch **UP** to report the emphasis mode in the AES Channels status bits. The ADC-9532 does not add emphasis in the conversion process. This control is only used to indicate that the analog signal into the unit has emphasis.

SW5 - Audio Sample Word Length

Use this switch to set the word length to either 20 or 24 bits per audio sample.

SW6 - 32kHz Sampling Rate

Set this switch **UP** to select the 32kHz sampling rate. Use with an AES or video reference as required. Ensure **SW7** and **SW8** are set to **DOWN**.

SW7 - 44.1kHz Sampling Rate

Set this switch **UP** to select the 44.1kHz sampling rate. Use with an AES reference only. Ensure **SW6** and **SW8** are **DOWN**.

The ADC-9532 will only provide a 44.1kHz sampled signal as long as it has a valid 44.1kHz AES reference signal. On loss of the 44.1kHz AES reference signal, the ADC-9532 will switch to internal reference at an undefined sampling rate. Note that the channel status bits will continue to show 44.1kHz sampling on the loss of the AES reference.

SW8 - 48kHz Sampling Rate

Set this switch UP to select the 48kHz sampling rate. Use with an AES or video reference as required. Ensure **SW6** and **SW7** are **DOWN**.

Status LEDs

The front panel of the module has LEDs (Reference and Power) that display the status of the input signals and indicate whether the device is on or off. **Figure 7** indicates the location of the LEDs. **Table 2** describes the status LEDs available on the ADC-9532.

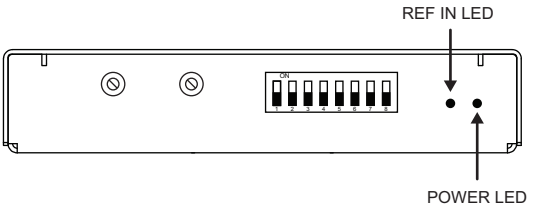


Figure 7 *ADC-9532 Status Indicator LEDs*

Table 2 Status LED Descriptions

LED	Color	Function
REF IN	Green	When lit green, this LED indicates that the selected reference is present and DIP switch selections are valid.
	Flashing Green	When flashing green, this LED indicates that the external reference is present, but the rate selection is invalid[a].
	Off	When unlit, this LED indicates a loss of reference, or that the external reference does not match the type of reference selected with SW3.

Table 2 Status LED Descriptions

LED	Color	Function
POWER	Green	When lit, this LED indicates the ADC-9532 is powered on.
	Off	When unlit, this LED indicates a loss of power.

a.The ADC-9532 will track the AES reference signal if the rate selection is incorrect.

Potentiometer Setup

The ADC-9532 can accommodate any full-scale digital (FSD) level in the -17dBFS to -27dBFS range. The analog stereo input signal from the 12-pin terminal block consists of an A and B channel (left and right).

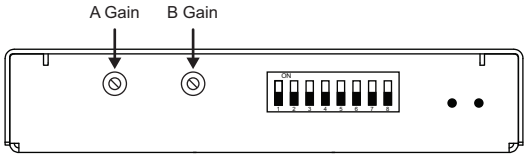


***Figure 8** Potentiometer Locations*

The fine input level and headroom adjustment is made using the **A Gain** and **B Gain** potentiometers. (**Figure 8** and **Table 3**)

Table 3 Potentiometer Adjustments

	Function
A Gain	Used to set fine level adjustment for Channel A
B Gain	Used to set fine level adjustment for Channel B

These potentiometers provide ±3dB adjustment on the -20dBFS and -24dBFS switch setting. Using these adjustments, the total headroom is adjustable over the -17 to -27dBFS range. Refer to the section "**Audio Levels**" on page 17 for further details.

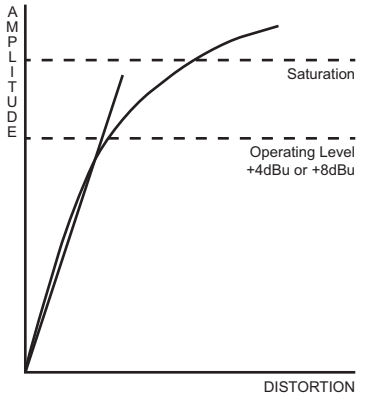


Figure 9 *Analog Audio*

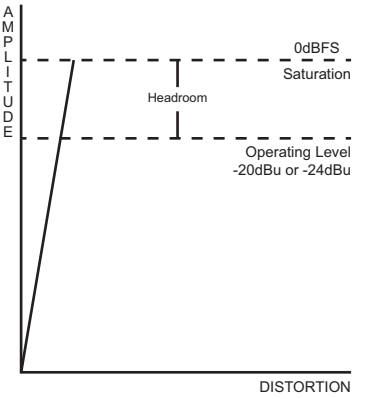


Figure 10 *Digital Audio*

Figure 9 illustrates amplitude vs. distortion for analog and digital audio equipment show that digital audio does not gradually degrade (become more distorted) as the amplitude increases. Likewise, the digital audio signal does not exist above 0dBFS. For these reasons, the interface between existing analog house reference standards and digital audio standards are as shown in **Table 4**.

Table 4 Analog House Reference and Digital Audio Interface

Reference	Headroom	Max. Input	Application
0dBu	14dB	+14dBu	AES/EBU for Audio Production
+4dBu	20dB	+24dBu	AES/EBU for Audio Production
+8dBu	18dB	+26dBu	AES/EBU for 525 Video
+4dBu	18dB	+22dBu	AES/EBU for 625 Video
+4dBu	22dB	+26dBu	AES/EBU for 625 Video

Specifications

Technical Specifications

Specifications are subject to change without notification.

Table 5 ADC-9532 — Technical Specifications

Category	Parameter	Specification
Analog Audio Input	Number of Inputs	2 balanced channels (1 stereo pair) via removable terminal strip
	Connector	12-pin screw-type
	Impedance	>25kohm
	CMRR	>70dB (20Hz to 20kHz)
	Max. Input Level Range	+17 to +27dBu (limit is variable)
Reference Input	Inputs	AES-3id or analog video (NTSC/PAL)
	Sampling Rates	32kHz, 44.1kHz, 48kHz
	Impedance	75ohm
	Connector	BNC
	Input Return Loss	>36dB (0.1 to 6MHz)
	AES Input Level	100mV minimum
		2.5V p-p maximum (continuous signal level)
AES/EBU Output	Number of Outputs	3 AES-3id (coaxial)
	Connector	BNC
	Sample Rate	AES Ref: 32kHz, 44.1kHz, or 48kHz
		Video Ref: 32kHz or 48kHz
		No Ref: 32kHz or 48kHz
	Impedance	75ohm
	Output Level	1.0Vp-p +/-5%

Table 5 ADC-9532 — Technical Specifications

Category	Parameter	Specification
AES/EBU Output	Output Isolation	45dB
	Output Return Loss	>45dB (0.1 to 6MHz)
	DC Offset	<50mV
Performance	Quantization	20bit or 24bit
	Frequency Response	±0.10dB @ 48kHz (20Hz to 20kHz)
	Signal to Noise Ratio	Measured at -20dBFS -102dB unweighted -105dB 'A' weighted -112dB CCITT weighted
	THD+N	Measured at -20dBFS -102dB (<0.006%)
	Linearity	0.002dB to -120dBFS
	Phase Linearity	0.0° (20Hz to 20kHz)
	Crosstalk	<80dB (20Hz to 20kHz)
	AES Reference Phase Error	<5% of frame period per AES 11-1997
	Delay	0.75mx
	Jitter	<2.5ns @ 48kHz <0.015UI @ 48kHz
Power	Power Consumption	<3.5W
Other	Operating Range	20°C to 40°C ambient
	Dimensions (approx.)	13cm x 9cm x 2.5cm (5" x 3.5" x 1")
	Weight (approx.)	312g (11oz)

Channel Status Data Table

indicates fixed and configurable channel status bit information.

Table 6 Channel Status Data

Byte	Bit	Function	Transmitted
0	0	Professional or Consumer use of Channel Status Block	Professional (1)
	1	Normal Audio or Non-audio mode	Normal Audio (0)
	2-4	Emphasis: user selectable	• Not indicated or No emphasis (000) • 50/15us Emphasis (110)
	5	Source Sampling Rate Locked (0)	
	6-7	Sampling Rate: user selectable	Set according to current sampling rate: • 32kHz (11) • 44.1kHz (10) • 48kHz (01)
1	0-3	Channel Mode	2 channel stereo (0001)
	4-7	User Bit Mode	192-bit (0001)
2	0-2	Auxiliary Bit Usage	• 20-bit audio sample, Aux bits undefined (000) • 24-bit audio sample (001)
	3-5	Sample Word Length: user selectable	20bit or 24bit (101)
3	0-7	Multi-channel Modes (0)	
4	0-7	AES 11 Sync Reference (0)	
5	0-7	Unused (0)	
6-9		ASCII Source ID (0)	
10-13		ASCII Destination ID (0)	
14-17		Local Sample Address (0)	
18-21		Time of Day Address (0)	
22	0-7	C data reliability (0)	
23	0-7	CRCC	Calculated CRC

Service Information

Warranty and Repair Policy

The GearLite ADC-9532 is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of THREE (3) years from the date of delivery to the customer. In the event that your GearLite ADC-9532 proves to be defective in any way during this warranty period, Ross Video Limited reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this GearLite ADC-9532 has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the THREE (3) year warranty period.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This GearLite ADC-9532 User Manual provides all pertinent information for the safe installation and operation of your GearLite Product. Ross Video policy dictates that all repairs to the GearLite ADC-9532 are to be conducted only by an authorized Ross Video Limited factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Ross Video Limited factory representative, will automatically void the warranty. Please contact Ross Video Technical Support for more information.

In Case of Problems

Should any problem arise with your GearLite ADC-9532, please contact the Ross Video Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your GearLite ADC-9532. If required, a temporary replacement module will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

The Ross Video Technical Support Department will continue to provide advice on any product manufactured by Ross Video Limited, beyond the warranty period without charge, for the life of the equipment.

Notes:

Contact Us

Contact our friendly and professional support representatives for the following:

- Name and address of your local dealer
- Product information and pricing
- Technical support
- Upcoming trade show information

Technical Support	Telephone:	+1 613 • 652 • 4886
	After Hours Emergency:	+1 613 • 349 • 0006
	Email:	techsupport@rossvideo.com

General Information	Telephone:	+1 613 • 652 • 4886
	Fax:	+1 613 • 652 • 4425
	Email:	solutions@rossvideo.com
	Website:	http://www.rossvideo.com

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